

REGIONAL COOPERATION IN FLOOD FORECASTING AND INFORMATION EXCHANGE IN THE HINDU KUSH- HIMALAYAN REGION



Final Report – Phase I

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I. Executive Summary

In May 2001, the International Centre for Integrated Mountain Development (ICIMOD) and the World Meteorological Organization (WMO) started a long term project on the establishment of a regional flood information system to reduce the flood vulnerability and minimize the negative impacts of floods in the Hindu Kush-Himalayas (HKH). The project is planned to be implemented in three consecutive phases. The first phase of the project, hereafter referred as “The Project”, was supported by the United States Agency for International Development’s Office of Foreign Disaster Assistance (USAID/OFDA) and the United States Department of State Regional Environment Office for South Asia (USDS/REOSA). The Project came to an end in December 2005.

The Project engaged high-level government representatives of national hydrological and meteorological services and organizations involved in flood disaster mitigation of Bangladesh, Bhutan, China, India, Nepal, and Pakistan. It also involved international experts from WMO and the United States National Oceanographic and Atmospheric Administration (NOAA) as well as the United States Geological Society (USGS) and representatives from the implementing and funding organizations in the dialogue aiming to promote regional cooperation in sharing flood data and information. The Project succeeded in fostering improved regional cooperation and has gained the generous support of five of the countries involved. India’s full endorsement could not be confirmed during this phase, though the Project has been successful in bringing India into all high-level meetings and discussions and, thereby, gradually encouraged greater participation. This process has been followed throughout the Project period leading to the establishment of the necessary agreements, mechanisms and infrastructure in the six participating countries of the HKH for a more efficient and comprehensive exchange of hydrological and meteorological data. The seed for regional cooperation has been sown and the Project is progressing positively towards fostering mutual trust and a reduction of mutual apprehension.

The major **achievements** of the Project are summarized as follows.

1. **Change in the culture of information sharing:** The Project has influenced a change in the culture of information sharing in the region. Information on the Pareechu lakeburst in Tibet, China in July 2005 was shared on time, for which the Project partly contributed. The successful real time data sharing during the Demonstration and Testing Phase and sharing of flood news through the regional network are evidence to this fact. The region has seen a greater willingness among the participating countries to share data and information, which will in future contribute to better flood forecasting and contribute to promoting sustainable economic growth by reducing flood vulnerability.
2. **Strengthened national and regional networks:** The Project has institutionalized cooperative arrangements among the five fully participating partners where there was none before. On a national scale, Pakistan has directly attributed the Pakistan national consultation and the Project as factors for an increased national recognition for flood disaster mitigation and their improved capacity to forecast floods with better accuracy. The Nepal national consultation created the opportunity for the Department of Hydrology and Meteorology (DHM) and Nepal Telecom (NTC) to work together. They have now successfully tested mobile and Code Division Multiple Access (CDMA) technologies for data transmission from the field to the national centre. The member countries have also agreed to work together and exchange expertise which is an important step towards improving regional networking.

3. **Strengthened bilateral cooperation:** Since its inception, the Project has emphasized the importance of achieving regional cooperation through the strengthening of existing bilateral agreements between the countries in the region. Pakistan has directly credited the Project for an improved real-time bilateral information exchange with India. The Project has thereby provided a unique opportunity to engage traditional rivals in a productive technical dialogue and enhance mutual understanding in a process which could be termed: "from potential conflict to improved cooperation". Further, China and India have agreed to work on bilateral cooperation for exchange of flood data and information on the Bramhaputra River. Bangladesh and Pakistan have offered to share technical know-how with Nepal and Bhutan, which is expected to materialize in Phase II of the Project.

These achievements have been possible through a series of meetings that were part of the Project. A number of reports and papers have been prepared with rich content about the status of flood forecasting in the region. The Project Document has grown in quality through the active support and valuable input from the participating member countries. As part of the Project, a project website www.southasianfloods.org was developed to serve as a regional platform for sharing of near real-time data and information. The Demonstration and Testing Phase was conducted to test the technical feasibility of sharing real time data and information. Given the geo-political constraints to collaboration on water issues in the region, the degree of cooperation achieved through the Project has been very satisfactory.

The Project Document has been submitted to Asian Development Bank (ADB) for consideration for funding of the Phase II of the Project. Apart from ADB other possible donors will be approached for mobilization of funds.

The Project has provided an opportunity to learn several lessons. The Project has shown that the aim of strengthening regional cooperation is a process which requires both a political will and meaningful technical cooperation. There is a need for continuous technical among the member countries through which trust and confidence can be further fostered.

II. The Project

Timely warning of impending floods is crucial not only to save lives and property, but also for the development, operation, and management of large water resource projects. To forecast floods with any degree of accuracy, however, it is necessary to have timely and reliable hydrometeorological information from the entire river basin. Since most of the rivers in the HKH region flow through more than one country, information must be exchanged across national borders.

The pressing need for a regional programme on flood disaster mitigation has been clear for a number of years, and especially since the disastrous floods of 1998 when thousands of lives were lost and property worth millions damaged. Two of the major challenges in this respect are collection of the necessary high quality hydrometeorological data in all parts of the major river basins, including in remote areas with limited infrastructure, and facilitating a system for exchange of this data in real-time between the countries through which each river runs.

In 2001, ICIMOD and the WMO initiated a project to promote regional cooperation in flood disaster mitigation with the support of the USDS/REOSA and the USAID/OFDA. ICIMOD's six regional partner countries Bangladesh, Bhutan, China, India, Nepal and Pakistan participated and contributed to the development of the Project.

For the development and implementation of a functional regional transboundary flood information system a three-phased process is envisioned:

- Phase I: Feasibility study and infrastructure testing;
- Phase II: Detailed planning and pilot project implementation; and
- Phase III: Implementation of a full-scale region-wide flood information system.

This Project report covers Phase I – Feasibility study and infrastructure testing the specific objectives of which are described below.

2.1 Goal

The overall goal of the Project is to minimize the loss of lives and property by reducing flood vulnerability in the HKH region with specific reference to the Ganges-Brahmaputra-Meghna (GBM) and Indus River basins.

2.2 Overall Objectives

Enhancement of regional cooperation among countries in HKH region for the timely exchange of flood information and data.

2.3 Specific Objectives

1. Assess the current institutional capacities, needs and requirements of the collaborating national institutions and recommend a framework for institutional linkages and cooperative mechanisms required for a regional flood information system;
2. Approve pilot basins and the hydrometeorological network for the establishment of a flood information system;
3. Organize a technical meeting to recommend a telecommunication strategy; and
4. Demonstrate the technical feasibility of all components of the proposed flood information system.

2.4 Countries Covered

Bangladesh, Bhutan, China, India, Nepal and Pakistan

2.5 Project Period

January 2002- December 2005

III. Achievements of Phase I

Water and its management have been and will remain a contentious issue in the region. This fact has often hampered efforts to harmonize and encourage transboundary sharing of data and information for improved water resources management. In this somewhat complicated geo-political landscape, the Project has provided an entry point for the countries to be engaged in a regional dialogue on flood forecasting and information exchange. The Project has garnered support and cooperation from five of the six participating countries towards the establishment of a regional flood information system. Through a series of meetings the Project has fostered mutual trust and confidence amongst the countries and developed a mechanism that would build upon the existing capacities of the countries towards the establishment of a regional flood information system. It has also helped to ease the tension between upper and lower riparian countries and enhanced communication.

Given the geo-political constraints to collaboration on water issues in the region, the degree of cooperation achieved has been very satisfying. The major achievements of the Project are described below.

3.1 Strengthened Regional Networks

The Project has provided a platform for exchange of data and information to support flood forecasting in the countries of the region. It has brought together high-level officials of the countries from various ministries and departments involved in the management of water resources, particularly floods. It has resulted in improved communication, increased trust and confidence among regional countries and wider networks. ***As a result of the Project the first steps toward a better flood disaster mitigation and risk management in the region has been taken.***

3.2 Increased Trust and Confidence Among Countries

A process of having a continued dialogue and increasing expanded agreement on the establishment of a regional flood information system has been established. Through the Project the normal routine of bilateral-only negotiations and agreements has been overcome, and discussion on issues of regional interest has been initiated. The dialogue and interaction during the regional and high-level meetings have contributed towards building of trust and confidence among the member countries. Technical and high-level officials participated in discussions on ways to further cooperation, which has helped the individuals towards better relationships paving way to improved bilateral cooperation.

3.3 Improved Awareness About the Need for Regional Cooperation

The Project, through regional dialogue and national consultations, has generated substantial interest among a variety of national, regional and global actors involved in disaster mitigation, prevention and effective response to climatic variability and increased extreme events. Among other groups, many local non- government organizations (NGOs) and international organizations working on flood preparedness in the member countries, the United Nations Development Programme (UNDP), the Asian Disaster Preparedness Centre (ADPC), the Asian Disaster Reduction Centre (ADRC), UNESCAP and the Red Cross have expressed interest in the Project. The Project results are recognized as having important implications for flood mitigation both within the region and, if replicated, for strategies in many other countries facing similar challenges.

Additionally, there has been national, regional as well as global coverage of the Project in the media. The BBC covered the Project in August 2005 focusing on the challenges the region has in sharing hydrometeorological data and the efforts the Project has made.

3.4 Enhanced Capacity of National Institutions

The countries in the region have different levels of technical capacities and know-how regarding flood forecasting and management. The regional meetings and discussions have provided an opportunity for the countries to exchange technical know-how and knowledge and contributed towards improved capacity of the partners. Further, the member countries have benefited from the participation of international experts. As part of the project a “flood network” was created to share flood related data, information and situation reports. The information included satellite rainfall estimates provided by NOAA. The countries expressed the usefulness of the satellite rainfall estimates and requested further training. As a result within the Regional Flood Project framework and as part of the Asia Flood Network (AFN) programme of USAID a Satellite rainfall estimate workshop was jointly organized for the partners in June 2005. This has contributed to the increased awareness and as per the implementation plans drawn by each participating country during the workshop a followup programme on Satellite Rainfall Estimation and its application is planned for 2006.

3.5 Confidence Building of Technical Staff

The consultations and meetings have brought together technical experts from the region, which has facilitated better understanding and promoted cooperation in flood information sharing. The meetings both at the regional as well as at the national level have enabled technical staff to interact and share information about their techniques, problems, and solutions through which they have developed mutual confidence and trust. Such confidence building has provided the basis for long-term sharing of flood-related information.

3.6 Improved Coordination Among National Institutions

The national consultations conducted in each of the partner countries brought together various stakeholders working together in flood management and sustainable development. The Project has enabled various players/institutions in the countries to engage in dialogue and better understand each other activities, roles and responsibilities. For example, in Nepal the Nepal Telecom (NTC) and the Department of Hydrology and Meteorology (DHM) are working together to test the Code Division Multiple Access (CDMA) technology to be used for real time transmission of data. Prior to the Project this kind of cooperation did not exist. Pakistan has attributed its national consultation to have brought about a change in the attitude towards hydrological and meteorological agency.

3.7 Strengthened Bilateral Cooperation

Since its inception, the Project has emphasized that the aim was to achieve regional cooperation through the strengthening of existing bilateral agreements and arrangements. Pakistan has directly credited the Project for an improved real-time bilateral information exchange with India. The Project has engaged countries into productive dialogue leading to a process of improved cooperation for exchange of flood data and information. China and India have also reached an agreement for sharing life saving data on floods. Prior to the Project there were no bilateral arrangements between China and India.

3.8 Demonstration of the Will and Technical Capability of Sharing Real-Time Data

In varying degrees, every participating country provided flood data and information products to the regional centre during the Demonstration and Testing Phase conducted

in monsoon 2005. It is the first time ever that the countries have come together to share hydrometeorological data on a regional platform.

IV. Lessons Learned and Constraints

The Project has provided an opportunity to learn several lessons. First and foremost, the Project demonstrated that the aim of strengthening regional cooperation is a process which requires both a political will and technical cooperation. Multiple stakeholders, including hydrometeorological experts, governments of different countries and donors, are involved in the Project and, therefore, the interest of each stakeholder assumes primary importance. From the experiences of this Project, lessons learned may be broadly classified as those that are political and those that are technical in nature.

4.1 Lessons Learned

4.1.1 Political Considerations

Time frame for establishing political will and translating plans to action

The Project has assumed the immense objective of establishing regional cooperation for sharing information about a sensitive issue – water. Water is one of the major economic resources for the region, which is predominantly agriculturally based. Information on national water resources is often restricted. The Project has been successful in bringing the partner member countries to a common platform to discuss the possibility of sharing flood information for the common objective of saving lives and property. It has achieved full support of five member countries and has slowly encouraged India towards greater participation. India has participated as an observer thus far.

Strengthening of regional cooperation for timely exchange of flood information is a process that requires full participation and commitment among all involved stakeholders. Within this process the building of trust and consensus among the participating countries and institutions is crucial and needs to be fostered and encouraged for an efficient and sustainable implementation of a regional flood information system. Considering the political significance of sharing data, the process of establishing regional cooperation has involved the participation of member countries at the higher official levels. Each member country has different policies and the Project has to adhere to as many protocols. In spite of the common understanding of the goal, its realization needs more time than initially anticipated. Each word is carefully weighed and reviewed, each activity is questioned and even the benefits derived from the Project is re-evaluated in several stages before the Project can progress to provide the benefits.

Further, the donor organization and the implementing organizations have their own policies, which can, sometimes act as positive interventions to ensure that every step is in order. Considering these factors, a longer time frame is required to harmonize all the member countries for sharing data on a common platform.

The need for a continued dialogue and a regional platform

Strengthening regional cooperation to minimize the loss of lives and property in the region requires a long-term strategy for which there is a need for continued meaningful dialogue among the countries through regular meetings on a regional platform. Dialogue is seen to be a key medium to build trust and confidence and prevent any misunderstandings amongst countries. Continued dialogue will lead to the smooth implementation of Phase II of the Project.

Working with different ministries

Often in many countries the hydrology and meteorology departments are separate institutions located in different ministries. For example, in Bangladesh and Pakistan the Meteorological Department is under the Ministry of Defense, while the Hydrology Department is under the Ministry of Water Resources. Hence, it is necessary not only to work through separate institutions, but also through different ministries where different rules and regulations need to be followed. Further, since water data sharing is highly sensitive, it also involves other ministries such as the Ministry of Home Affairs as well as the Ministry of Foreign Affairs. In this Project, only the technical line ministries were involved. In the future, other relevant ministries could be involved to expedite the process.

4.1.2 Technical and Infrastructure Related

Adequacy of resources, technical, infrastructure, know-how in the region

All the partner member countries are developing countries that have limited budgets for disaster mitigation and preparedness. Often, expenditure on disaster mitigation and preparedness is not a top priority in the countries. Hydrological and meteorological agencies, therefore, suffer from poor infrastructure and cannot sufficiently address the demands for an operational flood forecasting system. As a result the development of know-how has suffered in comparison to existing technologies.

Most of the hydromet station networks put in place in the countries are not adequate as per WMO specifications. Hence, there is a need for increasing the density of stations for producing meaningful forecasts.

Need for automation of data collection

Throughout the Demonstration and Testing Phase, there were traces of inadequacies in terms of use of sophisticated equipment in the region. Bhutan started sharing information from a delayed date because one of its selected stations was not equipped with high frequency (HF) transmitters. Temporary arrangements were made by Bhutan for a HF set, until it could obtain a set to be provided by the Project as part of minor upgrades.

Considering the importance of real-time data sharing, it becomes imperative for the Project to have automatic transmission of data from the observation station to the national centre and subsequently to the regional centre to enhance data reliability and improve lead time. This need was felt due to the delay in data submission experienced on a few occasions when the key person identified by each partner (focal point) for the Demonstration and Testing Phase was traveling or was on leave. Moreover, an automated data recording and collection system can improve data quality.

Need to improve communication network (satellite, mobile, CDMA)

Communication technology has improved exponentially during the last decade. However, due to high implementation cost for these technologies, the region still relies on traditional technologies such as HF radios. Pakistan is using meteorburst technology, which is more sophisticated than conventional methods. Data are manually read out through HF systems. These technologies do not operate well under severe weather conditions which are normally the periods when the need and usefulness of communicating data is highest. Of late, mobile phones are being used as an alternative method for transmitting data from field station to national centre. However, its use is limited in the sense that data are normally read out manually and the “error of commission” is maintained. Mobile technologies are more popularly used elsewhere for automatic transmission of recorded data. CDMA technologies provide the reliability of physically laid land lines and offer the portability of mobile phones. These are existing technologies that can be operated at minimal maintenance expenses especially where

vandalism is a problem. Satellite links could perhaps be the most reliable communication technologies.

Need for Improved institutional linkages and coordination

There is a need to strengthen institutional linkages and particularly linkages between communication operators and hydrometeorological agencies.

The Project has identified generally poor linkages within each participating country. Hydrometeorological agencies are working autonomously. Within the hydrometeorological domain, hydrological and meteorological agencies function as separate departments or branches of the same umbrella department; there is very little communication between them. There are other disaster relief, aid and health organizations and each institution works autonomously. Activities in flood disaster prevention, risk management and vulnerability require a coordinated and integrated approach involving all stakeholders leading to reduction in vulnerability.

Harmonization of equipment

The Partner countries have different levels of expertise and technical know-how. Based on this expertise the equipment used and currently put in place also varies. Given the differing knowledge and know-how and instrumentation put in place and the varying terrain and geology it may not be practical to use the same type of equipment and supplier. The equipment of one supplier could be designed better for narrow and steep mountain rivers, whereas other suppliers' equipment may be better designed to address the needs of large rivers. Given the varying nature of rivers in the region, a cross platform of equipment is required.

Quantitative rainfall estimates

There is a need for quantitative rainfall estimates using satellite technology for better boundary conditions for improved weather forecasting. For example the Flood Forecasting and Warning Centre of the Bangladesh Water Development Board (BWDB) uses rainfall estimates for their model to provide flood forecasts. Experience from Bangladesh shows that models need quantitative forecast but the Bangladesh Meteorological Department (BMD) only provides qualitative forecasts.

Capacity building and technology transfer

There is a need for training and capacity building on various components of flood forecasting for countries to be able to provide reliable and timely forecasts. These include installation of equipment, operation and maintenance, modeling and analysis of data.

End users

It is important to keep the end users in mind while developing an “end to end” flood forecast. It is important to draw on the expertise and knowledge that already exists, and improves flood preparedness measures both through community understanding and technical ability to ensure accurate and timely early warnings.

4.2 Constraints

In some countries, hydrology and meteorology departments are under separate organizations. Coordinating with different organizations has been a challenge for the Project since often these organizations are working autonomously and with limited coordination. Also, these organizations are under different Ministries and are subject to different policies and regulations.

The water policies in the partner countries are not developed within a regional framework. Regional cooperation for sharing flood data is a relatively new concept and requires some gestation time for making appropriate adjustments. It is a process requiring the involvement of high-level authorities. The process takes into consideration political, economical and geographical aspects and hence requires a lot of patience and persistence.

Since the Project involved working mainly through government partners often the time taken for decisions was very long. This could mainly be because of the different levels within the government. For example, the process of taking approvals for participating in Project meetings had to go through different levels within the involved department/ministry thus slowing down the process and the pace of the Project. This was more complicated when it involved different ministries and has lead to the delay in completing some of the planned activities.

In some countries there was a frequent change in high-level officials within the organization. The high-level officials either retired or were transferred to other organizations. This also resulted in slowing down the pace of the Project as the new officials had to be re-oriented about the Project.

India's policy to deal with neighboring countries is only on a bilateral basis. This policy was reiterated in the high-level meetings held as part of the Project. Though the Project created an opportunity for multilateral dialogue and communication given its bilateral stand, obtaining India's full cooperation was one of the major challenges of the Project. Due to this position taken by India and the lack of response from the Government of India the planned national consultation to establish a regional flood information system could not be held in India.

V. Results of the Project

The overall objective of the Project was the enhancement of regional cooperation between countries in the HKH region for the timely exchange of flood information and data. The Project activities were planned and implemented to achieve the four specific objectives of the Project. The Project has engaged high-level government representatives of the national hydrological and meteorological services and organizations involved in flood disaster management of Bangladesh, Bhutan, China, India, Nepal, and Pakistan. It also involved international experts; and representatives from the implementing and funding organizations in the dialogue aimed to promote regional cooperation in sharing flood data and information. The Project has successfully fostered regional cooperation and has gained the generous support of five member countries. India's full endorsement could not be confirmed during this phase, though the Project has been successful in bringing India into all high-level meetings and discussions and thereby, gradually encouraged its greater participation. The programme performance is reported as per the specific objectives and is given below.

5.1 Specific Objective 1: Assessment of the current institutional capacities, needs and requirements of the collaborating national institutions and recommend a framework for institutional linkages and cooperative mechanisms required for a regional flood information system

This objective was accomplished through a series of high-level meetings, national consultations and through conducting the Demonstration and Testing Phase. During the national consultations in Bangladesh, Bhutan, China, Nepal and Pakistan, the partners presented their institutional capacities in flood forecasting and information exchange in terms of human, infrastructure and technical resources. For example Bhutan identified the need to focus on flash flood forecasting system particularly for Glacial Lake Outburst Flood and in capacity building for human resources development. The results of each of the National consultations have been documented in the reports available for each country and is summarized in Table 1. India participated in all high-level meetings and was a part of the regional forum in the capacity of an observer.

During each of the national consultations and meetings there were representatives from ICIMOD, WMO and international experts from the NOAA as well as the USGS. These Project partners facilitated the development of trust and confidence amongst the participating institutions as well as helped the countries to identify their capacities and gaps in flood forecasting and information exchange. The needs assessment is presented in Table 2. During the consultations the countries expressed the need and benefits of establishing a regional flood information system, mainly increasing lead time and technological up-scaling. Some countries have directly credited the national consultations as a forum that enabled them to reflect and evaluate their capacities. It also provided an opportunity for other organization and institutions from the respective countries to know and understand their work better and contributing to better collaboration and coordination amongst various institutions.

During national consultations held in each of the participating countries a need to address flash floods separately was expressed given the similar hydrometeorological and topographical conditions. All partners have acknowledged that there is increasing frequency and magnitude of flash floods due to climate change, glacial lake outburst floods (GLOFs), and land use and land cover changes. Flash flood is considered to be one of the biggest contributors to loss of lives and economic damage in each of the participating countries. This has lead ICIMOD and the partner countries to work together on a programme in Flash Floods and sustainable development in the HKH region. An

International Workshop on Flash Floods Management was held in Lhasa, Tibetan Autonomous Region of China from 23-27th October 2005.

As part of the current Project, a Demonstration and Testing Phase was conducted during the monsoon of 2005 from June to September. During this phase a feasible mechanism for sharing real-time data for each participating country was developed. Furthermore, this phase has demonstrated the willingness of countries to be part of a regional mechanism to share real-time data.

Table 1: Summary of National Capacities

	Bangladesh	Bhutan	China (TAR)	Nepal	Pakistan
Station Network					
Hydrological Stations	86 [for FF purposes]	20 (10 primary and 10 secondary)	15	154	
Meteorological Stations	55 [for FF purposes]	80 (12 Class A station, 64 Class C stations, 4 special stations)		442	64
Data Collection & Transmission					
Data Collection Period *	All Year	All Year	All Year	All year	All Year
Data Collection Method	Manual and automatic	Manual	Manual and automatic	Manual	Manual and automatic
Data Transmission Period *	All Year	All Year	All Year	Monsoon	All Year
Data Transmission Method	Wireless (SSB/ HF) Mobile	Wireless (SSB/ HF)	Satellite Wireless (SSB/ HF)	Wireless (SSB/ HF)	Meteobrust technology Telemetric/ SSB /Phones
Data provided to other countries		India	India	India, Bangladesh	
Hydrometeorological Equipments **					
Staff Gauge	✓	✓	✓	✓	✓
Evaporation Pan	✓	✓	✓	✓	✓
Rain Gauge	✓	✓	✓	✓	✓
Cable Ways	***	✓		✓	
Telemetric river and rain sensors	✓				✓
Sediment Sampling	✓	✓		✓	✓
Radar	✓				✓
Sunshine recorder	✓	✓	✓	✓	✓
Thermometer	✓	✓	✓	✓	✓
Barometer	✓	✓	✓	✓	✓

* The frequency of data collection and transmission is increased as required during flood season, sometimes on an hourly basis

** Only selected parameters are provided listed and which do not represent an exhaustive list of possible equipments.

It should also be noted that while the table appears to show that the countries have adequate capabilities, the truth is that the conservative technologies are employed to make the measurements. The table is characteristic of the technological awareness of the particular country. All stations are not necessarily equipped with these equipments. A more detailed and fuller study is proposed for Phase II of the project.

*** Due to the fact that rivers in Bangladesh are too wide, in the order of several kilometers, cable ways are technically not feasible options in Bangladesh

Table 2: An assessment of country needs

	Bangladesh	Bhutan	China	Nepal	Pakistan
Disaster Management Plan		✓		✓	✓
Human Resources	✓	✓	✓	✓	✓
Additional Staff				✓	
Training for Trainers				✓	
Training for Field observers		✓	✓	✓	✓
Hydrometry	✓	✓	✓	✓	✓
meteorological observation	✓	✓	✓	✓	✓
information transmission	✓	✓	✓	✓	✓
data quality checking		✓	✓	✓	✓
Training for Station Technicians		✓	✓	✓	✓
Communication Technology		✓	✓	✓	
Equipment Installation	✓	✓		✓	✓
Equipment Maintenance	✓	✓	✓	✓	✓
Training for Professionals		✓	✓	✓	
Data Processing and Analysis	✓	✓	✓	✓	✓
Database Management		✓	✓	✓	✓
Hydrological Modeling			✓	✓	✓
Meteorological Modeling			✓	✓	
GIS			✓		✓
Information Dissemination			✓		✓
Web Publishing			✓		✓
Technical Knowhow	✓	✓	✓	✓	✓
Modeling Software				✓	
Programme design	✓	✓	✓		
Data Collection	✓	✓	✓		
Transmission	✓	✓	✓		
Processing	✓	✓	✓		
Monitoring and forecasting			✓	✓	✓
Flash Flood	✓	✓	✓	✓	✓
Flood	✓	✓	✓	✓	✓
Landslide		✓	✓	✓	✓
Hydrological Modeling			✓	✓	✓
Flood Management techniques	✓		✓	✓	✓
Staff Exchange Programme	✓	✓	✓	✓	✓
WMO Standard Training	✓	✓			✓
Equipment	✓	✓	✓	✓	✓
Central Station	✓	✓		✓	✓
Data Collection Platform	✓	✓		✓	✓
PC Compatible DCP software		✓			
Automatic Equipment	✓	✓	✓	✓	✓
Automatic Water level Recorder		✓	✓		✓
Telemetry Equipment			✓	✓	✓
Rainfall Data Logger		✓	✓		✓
Water Level Data Logger	✓	✓	✓	✓	
Hydrometric Measurement			✓		
ADCP			✓		
GPS			✓		
Discharge/Sediment			✓		

Non-submersible Pressure Transducer		✓			
Digitized Propeller type velocity meter		✓			
Communications Facilities	✓	✓	✓	✓	✓
Digital Data Transmission System	✓				
Automatic Transmitters			✓		
Radio and Wireless (UHF/VHF)		✓	✓	✓	✓
Internet Transmission and Security	✓	✓	✓	✓	✓
Satellite Communication	✓		✓	✓	✓
TCP/IP			✓		
Handheld Units		✓			
Meteorburst System					✓
PC		✓		✓	✓
Fax transmission		✓			
GIS for real time data display		✓			
Finances	✓	✓	✓	✓	✓

5.2 Specific Objective 2: Approval of Pilot basins and the hydrometeorological network for the establishment of a flood information system

A set of criteria for the selection of the pilot basins and hydrometeorological stations were developed and agreed upon by the partners during the second high-level meeting. These are presented under:

- **Operational feasibility:** the basins (sub-basins) need to be operationally feasible for pilot studies
- **Suitability for testing:** the basins (sub-basins) need to be suitable for testing of different equipment and models
- **Saving of lives and property:** the implementation of the project in the basins (sub-basins) should help in a tangible way to save lives and property through an improved framework for flood forecasting
- **Expansion of coverage:** the selected basins (sub-basins) should allow expansion of the existing station networks, i.e. the network, selected for the pilot basins can become part of the regional flood information network
- **Trans-boundary:** the basins (sub-basins) from trans-boundary rivers should be selected for pilot studies as a priority

These criteria were used in a series of dialogue and meetings among stakeholders in each partner country for the identification of pilot basins and hydrometeorological stations to be used for the sharing of real-time data and information within the Project framework. During the national consultations the participating institutions formally presented and endorsed the hydrometeorological stations achieving this specific objective. The Project has continued the dialogue on regional cooperation in flood disaster mitigation and identified national needs and capacities of member countries within the framework of the Project and identified hydrometeorological stations for the Project. The list of the hydrometeorological stations selected by the partner countries is presented in Table 3.

Table 3: Hydrometeorological Stations Selected During National Consultations

Country	River Basin	Station	Station Type	Longitude	Latitude
Bangladesh	Brahmaputra	Bahadurabad	Hydrological	89.70	25.16
	Brahmaputra	NoonKhawa	Hydrological	89.77	25.62
	Brahmaputra	Kurigram	Meteorological	89.63	25.78
	Brahmaputra	Nilphamari	Meteorological	89.57	25.95
	Brahmaputra	Rangpur	Meteorological	89.23	25.73
Bhutan	Brahmaputra	Samdingkha	Hydrological	89.86	27.58
	Brahmaputra	Autsho	Hydrological	91.18	27.43
	Brahmaputra	Kurizampa	Hydrological	91.19	27.27
	Brahmaputra	Punakha	Meteorological	89.87	27.58
China	Brahmaputra	Nugesha	Hydrological	89.70	29.35
	Brahmaputra	Nuxia	Hydrological	94.57	29.47
	Brahmaputra	Lhuntse	Meteorological	94.33	29.67
Nepal	Ganges	Karmaiya	Hydrological	85.47	27.12
	Ganges	Devghat	Hydrological	84.43	27.72
	Ganges	Kathmandu	Meteorological	85.37	27.70
	Ganges	Pokhara	Meteorological	84.00	28.22
Pakistan	Indus	Marala	Hydrological	74.46	32.66
	Indus	Mangla	Hydrological	73.68	33.12

5.3 Specific Objective 3: Organization of a Technical meeting to recommend a telecommunication strategy

A technical meeting was held from 29 November – 1 December 2004 to discuss the technical aspects of the Project and the telecommunication strategy.

The meeting emphasized on strengthening and developing practical applications currently being carried out in the region. Equipment, human resource and training needs were discussed and remedial issues such as strengthening current capacities and network were considered. Discussions also took place on the problems involved with data collection and dissemination, forecast modeling and information sharing in the countries. A Regional Telecom Strategy was prepared by ICIMOD and WMO with inputs from the regional member countries which was discussed and agreed during the technical meeting. The meeting also provided an opportunity to discuss the Demonstration and Testing Phase as well as preparing a road map for its smooth implementation.

5.4 Specific Objective 4: Demonstrate the technical feasibility of all components of the proposed flood information system

The Demonstration and Testing Phase was conducted from June – September 2005. The Demonstration and Testing phase successfully tested the technical feasibility of the flood information system components in terms of the feasibility of exchange of flood-related hydrological and meteorological data on a real-time basis among five countries: Bangladesh, Bhutan, China, Nepal and Pakistan. It focussed upon the existing infrastructure for data collection and capacities of the participating countries for flood forecasting. It also provided limited upgrades of the hydrometeorological stations to facilitate the sharing of real-time data and information exchange during this phase. Furthermore, it built upon the existing capacities and infrastructure put in place in the countries for data collection and transmission. It thereby, demonstrated the technical feasibility and the possibility for no- to low-cost sharing of data and information. In

preparation for the Demonstration and Testing Phase, a requirements analysis was conducted in each country prior to the selection of technology for the upgrade of the system. In the process international experts from WMO and USGS/NOAA were consulted. The testing of real-time sharing of data and information built on years of practical experience that already existed in the countries of the region. During the phase, cost-effective communications and data-sharing alternatives were explored. As a result of this phase a database and an information exchange mechanism has been developed and tested.

VI. Activities conducted in the project

The Project began in July 2001 after the first high-level meeting was successfully held and following the recommendations of the meeting. The Project was implemented in two parts. The first part, from July 2001 to March 31, 2003 included the Consultative Panel and second high-level meetings. The second part was from April 2003 to December 31, 2005, and included the national consultations, technical meeting and the Demonstration and Testing Phase. An account of the first high-level meeting and the Project activities, in chronological order, are given below.

6.1 First High-level Meeting, May 2001

In May 2001, ICIMOD and WMO organized a high-level consultative meeting on 'Developing a Framework for Regional Cooperation in Flood Forecasting and Information Exchange in the HKH Region' with the objective of developing a framework for a regional flood information system to support disaster prevention and flood disaster management. The meeting was supported by the USDS/REOSA, the USAID/OFDA, and the Danish International Development Agency. Participants from Bhutan, Bangladesh, China, India, Nepal, and Pakistan recognized the potential for mutual technical assistance and the need for regional cooperation in flood forecasting and data and information dissemination, reached a consensus on the need to share high flow data, and adopted an action plan for future activities. The participants agreed that further initiatives were required to improve flood forecasting in the entire region, in particular in improving hydro-meteorological networks, telecommunication and dissemination of real-time data and information, forecasting techniques and reliability, access to data and information, and capacity building.

The meeting created a unique opportunity for high-level government representatives, directors of national hydrological and meteorological services and technical experts from the region and international organizations to share information on the extent of flood problems in the region and to discuss organizational and technical approaches to flood forecasting and mitigation of flood-related damages. The participants fully recognized the significant benefits that can be derived from multilateral efforts in sharing of data and information to improve timeliness and accuracy of flood-related information. During the three-day meeting, the participants discussed and agreed on a framework for the development of a Flood Information System including state-of-the-art observations, communication technology, modeling, capacity building, and sharing of hydrological and meteorological data and information on the HKH region. Participants agreed on an initial action plan for Regional Cooperation for Flood Information Exchange which would be coordinated by ICIMOD in cooperation with regional countries and WMO.

It was agreed that the basis for the development of a regional framework for collaboration would be to build on the existing and successful bilateral agreements between countries. This would allow for exchange of data and information beyond the limitations of bilateral agreements in the context of regional and even global interests. Regional and global frameworks for cooperation for weather forecasting and the detection of climate variability and change are successfully operated within the World Weather Watch Programme of WMO. In the field of hydrology and water resource management, the World Hydrological Cycle Observing System (WHYCOS) of WMO has developed a similar system, promoting regional and global cooperation along specific interests that are identified by WMO's regional partners.

The participants agreed on an 'Action Plan' for the development of regional cooperation in flood disaster mitigation in the HKH region. The action plan laid out the activities for the first part of the Project which included the formation of a Consultative Panel, holding

of a consultative meeting for preparing the concept, holding of the 2nd high-level meeting and preparation of a Project Document.

The following points marked the key achievements of the meeting:

- Exchange of knowledge and know-how in flood forecasting in the region and examples from outside the region;
- Information on existing concepts for regional cooperation in hydrology;
- Identification of the aims and objectives of a regional flood information system;
- Agreement on the implementation of a regional flood information system using the WHYCOS concept of WMO and scientific support through the Hindu Kush – Himalayan Flow Regimes from International Experimental Data (HKH-FRIEND) project under the auspices of UNESCO;
- Adoption of an action plan and the establishment of a consultative panel; and
- General commitment by participants to further support and assist in the development of this important regional initiative.

6.2 Formation of the Consultative Panel

A Consultative Panel for the establishment of a flood information system in the HKH region was set up following the decision by participants of the 1st high-level meeting. The principal task of the Consultative Panel was to advise and provide support to representatives of participating countries, ICIMOD and WMO in the development of a flood information system in the HKH.

6.2.1 The First Consultative Panel Meeting, May 2002

In May 2002, the first meeting of the Consultative Panel was organized jointly by ICIMOD and WMO. The basis for discussion during the meeting was a concept document that was prepared by ICIMOD and WMO. The draft version of this document was circulated to participants prior to the meeting. The motto for the meeting was ***'Making information travel faster than flood waters'***.

The meeting was attended by government representatives of national hydrological and meteorological services from partner countries, international experts and representatives from the implementing and funding organizations.

During the meeting, the concept document was extensively reviewed and its text agreed upon by all participants. The representative from India provided an additional note that documented the official stand of the Government of India with regard to the further development of the Project. The agreement on the concept document was an important achievement for the promotion of the project's objectives and deliverables in the countries of the HKH region. The concept document is the reference document for the development of the Project, especially with regard to the framework and implementation strategy. The document was used to promote the development of this regional Project at the level of relevant ministries and hydrological as well as meteorological services in the partner countries.

Members of the panel agreed that the Project design should build on existing bilateral agreements put in a regional context within a regional dialogue, and on technical cooperation in flood forecasting and the sharing of real-time data and flood-related information.

To facilitate the development of the draft Project proposal, the meeting defined the logical framework for the Project including its objectives, expected results and key activities that need to be undertaken during the Project which is incorporated in the

Project Document. In discussion of the regional context of the Project, the panel recommended that Afghanistan and Myanmar should be invited to join the regional initiative.

The panel agreed on the need to identify pilot basins to test the technical feasibility of the project and encouraged its members to identify such basins. Participants welcomed the establishment of a prototype webpage that was demonstrated during the meeting. Participants recommended that national agencies should feed this web portal with information relevant to the needs of the region. The preparedness of participants to exchange good practices, know-how and expertise in modeling, flood forecasting and dissemination of information is seen as the basis for building a knowledge base in the region and beyond.

Further, Panel members recommended that capacity building should form an important cross-cutting component of the Project to improve national regional scientific, technical and managerial capabilities to establish, operate and maintain complex flood information systems.

The Panel agreed on short-, medium-, and long-term action plans for regional cooperation in flood forecasting and information exchange and provided input to the second high-level consultative meeting.

6.3 The Second High-level Consultative Meeting

The second high level consultative meeting was held in Kathmandu in March 2003. More than sixty participants, including representatives of the eight countries of the HKH region – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan – international experts, and representatives of the implementing and funding agencies gathered to discuss the draft Project Document. The meeting was organized jointly by the ICIMOD and the WMO, co-hosted by the DHM of His Majesty's Government of Nepal.

The principle objectives of the meeting were to discuss the draft Project Document on the development of a regional flood information system and agree on technical, managerial and implementation aspects; to present state-of-the-art accounts of flood forecasting and information systems; to develop an action plan to help promote the Project with national implementing agencies, regional organizations, and donor agencies; and to provide input to WMO and ICIMOD on the final version of the Project proposal.

The meeting was held in two parts - a technical conference and the second high level consultative meeting itself. The background information for the discussions was presented at the technical conference, with twelve presentations by international and regional technical experts on flood forecasting and information exchange. The papers discussed state-of-the-art methods for flood forecasting, transmission systems, integrated hydrological information, network design, flood management, and information dissemination. The technical conference provided a venue for participants to share experiences and learn more about how each country approaches data collection and dissemination, and provided the necessary background for the later discussions. The consultative meeting itself focused on discussion of the draft Project document and conceptual, technical, organizational, and operational issues related to the Project implementation.

They recommended that the experiences of the regional countries be taken into consideration in the selection of the equipment and flood information system to be used in the Demonstration and Testing Phase and made recommendations that the national consultations be held in each country as a component of the feasibility study. These national consultations were recommended to identify and assess individual countries'

needs and priorities for a flood information system, and to suggest pilot basins as possible test sites.

The participants also agreed on an action plan for further implementation of a regional flood information system and adopted a resolution endorsing the Project subject to the revision of the draft Project document.

The key achievements of the meeting were:

- Exchange of knowledge in state-of-the-art flood forecasting and information exchange both from within the region and from outside it;
- Detailed discussions on the draft Project Document for the establishment of a regional flood information system;
- The regional countries present unanimously agreed to encourage both WMO and ICIMOD to continue in their endeavors to pursue further steps that would ensure implementation - this could also including mobilizing resources;
- Adoption of an action plan;
- Willingness of the regional countries to hold national consultations;
- Participants approved the commencement of a testing phase during which the technical feasibility of the Project will be demonstrated; and
- General consensus by all participants to continue to support the development of this important regional initiative.

6.3.1 The Project Document

A draft Project Document was prepared by ICIMOD and WMO on the basis of the concept paper and the information obtained in response to a questionnaire sent to participating countries that looked at the way in which the collaborating institutions deal at present with the impacts of flood-related disasters, their aspirations for a regional flood information system, their needs for technical resources and capacity building to implement the Project; their perception of the potential benefits of regional cooperation on flood forecasting; and their preparedness to share data and information with the region. This Project document was circulated to the member countries prior to the second high-level consultative meeting. This document was further revised and discussed during the high-level meeting in Bhutan in May 2005. Further comments were received which were incorporated and has been submitted to the countries for the government endorsements.

6.4 National Consultations

As recommended during the second high-level meeting, ICIMOD in collaboration with WMO and the partner countries conducted a series of national consultations in each of the partner countries, except India. The national consultations provided an opportunity for all stakeholders to assess the current institutional capacities. This included technical know-how and human resources, needs and requirements. The consultation recommended specific institutional linkages, frameworks and cooperative mechanism required within the country for establishing a regional flood information system. The consultation provided an opportunity for national agencies to identify needs of equipment and communication systems at a basin level to be installed for Phase II for real-time sharing of data. Based upon the criteria developed for pilot basin selection the stakeholders identified hydro meteorological network and stations for the Project.

The national consultations were conducted on the following dates:

S No	National Consultation	Period
1	Bhutan National Consultation	22-24 July 2003
2	China National Consultation	24-25 September 2003
3	Bangladesh National Consultation	15-16 October 2003
4	Pakistan National Consultation	9-11 February 2004
5	Nepal National Consultation	16-17 March 2004

The national consultation for India has been a much planned event. However, in spite of laborious and diplomatic deliberations from ICIMOD, the donor organizations as well as WMO, the Project has thus far been unable to hold the consultation. All through, India has participated as an observer and there are positive indications in bringing India on board this regional Project. However, India's changing perspective on regional cooperation may be viewed as an achievement of the Project.

6.4.1 Synthesis of National Consultations

A summary of the national consultation as well as reports has been prepared. The biggest value added by the national consultations was the validation of the concept that a regional cooperation is essential for this flood prone region with a dense, vulnerable population.

The list of hydrometeorological stations selected during the national consultations is provided in Table 4 and shown in Figure 1. The selected stations would be considered for upgrade during the second phase of the Project. The stations were selected using the criteria developed during the second high-level meeting as follows:

- **Operational feasibility:** the basins (sub-basins) need to be operationally feasible for pilot studies.
- **Suitability for testing:** the basins (sub-basins) need to be suitable for testing of different equipment and models.
- **Saving of lives and property:** the implementation of the Project in the basins (sub-basins) should help in a tangible way to save lives and property through an improved framework for flood forecasting.
- **Expansion of coverage:** the selected basins (sub-basins) should allow expansion of the existing station networks, i.e. the network, selected for the pilot basins can become part of the regional flood information network.
- **Transboundary:** the basins (sub-basins) from trans-boundary rivers should be selected for pilot studies as a priority.

The national consultations took stock of current capabilities of the countries in terms of infrastructure, equipments and technological know-how and their needs. These are documented in the national consultation report.

The biggest thrust provided by the national consultations was the strengthening of national networks in each of the member countries. Where agencies worked autonomously, now there are successful collaborations geared at working progressively. The consultations have also helped the national hydrometeorological agencies to gain national recognition.

In Nepal, national agencies like the DHM and NTC have started work on a collaborative basis. Prior to the National Consultation in Nepal there was limited cooperation and collaboration. NTC is now aware of DHM activities and works together with DHM by providing advice on appropriate telemetry. Together they have successfully tested the

use of CDMA though CDMA is still awaiting national coverage. In Pakistan, flood forecasting division now enjoys higher recognition and a national priority for flood forecasting.

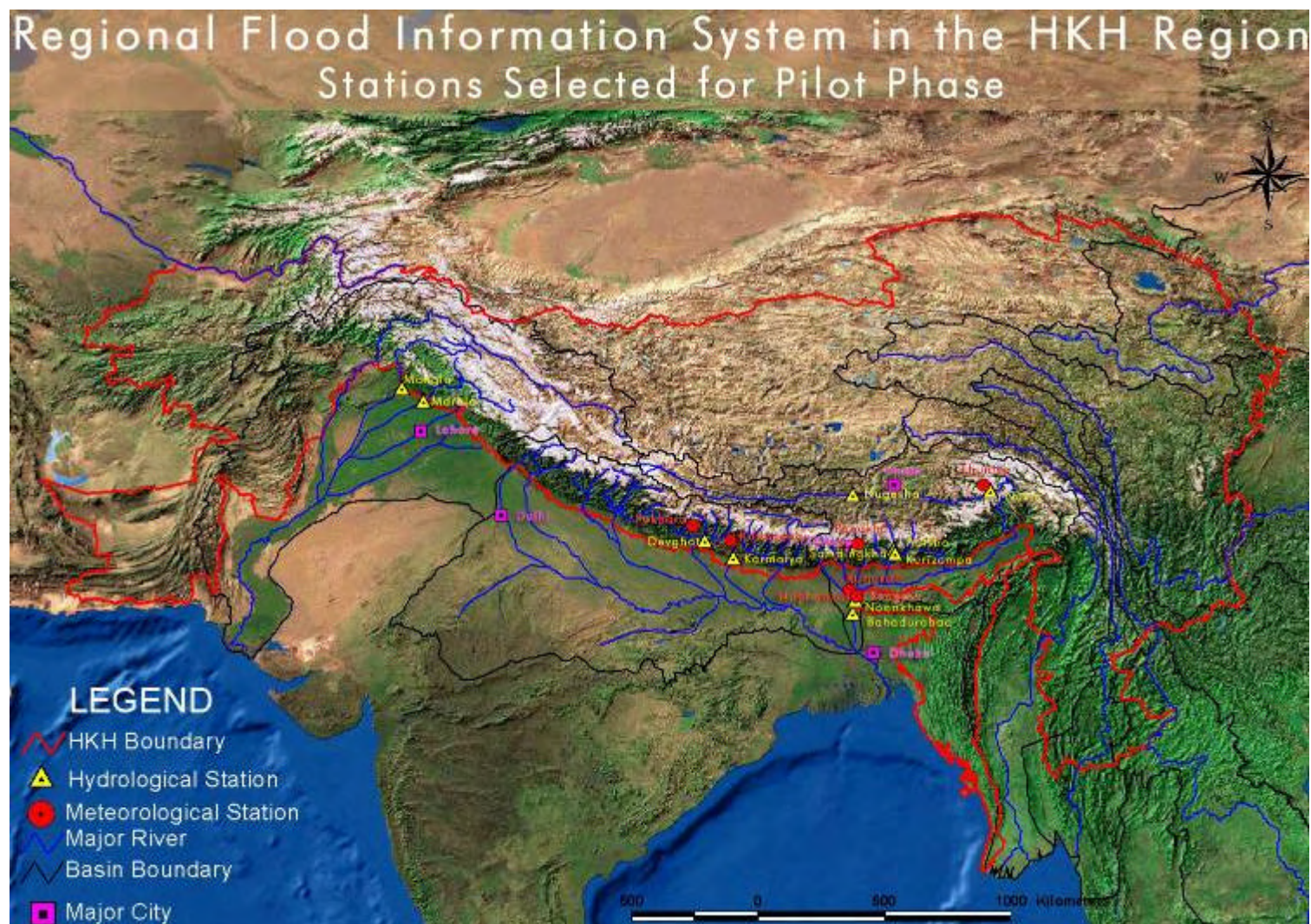


Figure 1: Pilot stations selected during the national consultation

The national consultations identified the need to hold a technical meeting to discuss the technical aspects of the Project and in particular aspects of telecommunication to collect, share and exchange near real-time hydrological and meteorological data on a regional level building up from already existing practices in participating countries.

6.5 Technical Meeting

As per the recommendation of the national consultations a technical meeting on “Country and Regional Telecommunication Strategies, Data Management and Dissemination of Regional Flood Information for the Establishment of a Regional Flood Information System in the HKH Region” was held in Katmandu, Nepal from 29 November – 1 December 2004. The meeting emphasized on strengthening and building upon the practical applications currently being carried out in each of the countries of the region. Equipment, human resource and training needs were discussed and remedial issues such as strengthening current capacities and networking were considered. Discussions were held on the problems involved with data collection and dissemination, flood warning information products, regional telecom strategy and data management.

A Regional Telecom Strategy was prepared by ICIMOD and WMO with inputs from the regional member countries. The strategy was discussed and agreed during the technical meeting. Each country also presented their current capabilities in collection and transmission of data.

The technical meeting was successful in making the following recommendations for establishing a regional flood information system:

- Internet should be the primary medium of sharing data;
- Alternate data submission methods also should be made available;
- Project website should be used for archiving and sharing data;
- Minor upgrades should be provided to a few stations;
- For developing the Information System as required, a manual should be prepared documenting information flow and country nodes, the methods for data submission and technologies; and
- Strengthening and building upon the practical applications currently being carried out in each of the countries of the region.

An action plan was developed for the activities of 2005 centering on a Demonstration and Testing Phase for sharing near real time data. The countries specified the frequency and data that will be shared during the Demonstration Phase. These are indicated in Table 4. Further, the Project agreed to provide minor upgrades to selected pilot stations and conduct the demonstration and testing phase based on the current capacities.

Table 4: Data and Frequency Agreed for Sharing During Demonstration Phase

Country	National Focal point	What data	Transmission frequency	Station-National-PRC, clarifications
Bangladesh	Flood Forecasting and Warning Centre (FFWC), BWDB	Historic data, real time water level data, and rating curves Need to consult concerned authority for Meteorological data	Once a day	a. Wireless; manual, mobile phones b. Internet
Bhutan	Hydromet Services Division, Department of Power	Water level, rating curves, precipitation, Historic data	Once a day	a. Manual, HF but can upgrade to landline if required b. Internet
China	MIC, CMA for meteorological data Tibet Bureau of Hydrology for Hydrological data	Water level, discharge, precipitation, urgent need to upgrade Nuxia	Two times a day(8 am and 8 pm), Nov – May if the water level rises beyond the warning level Meteorological data four times a day	a. Wireless manual, b. Dedicated line c. GTS, internet
Nepal	Department of Hydrology and Meteorology (DHM)	Water level, precipitation	Once a day	a. Wireless HF b. Internet
Pakistan	Flood Forecasting Division (FFD), Pakistan Meteorological Department, Lahore	Water level, precipitation, rating curves	6 hourly per day	a. Meteorburst b. Internet

6.6 High (Secretary) Level Meeting

A high (Secretary) level meeting was held in Thimpu, Bhutan from 17-19 May 2005. The participants were high-level government representatives and the senior management representatives of the national hydrological and meteorological services of Bangladesh, Bhutan, China, India, Nepal and Pakistan, and representatives from donor organizations, including the ADB, the Netherlands Development Organization (SNV) and Swiss Agency for Development and Cooperation (SDC). The representatives of India participated in the meeting in an observer status. The principal objective of the high-level meeting was to finalize and reach consensus on the draft Project Document which forms the basis for seeking donor support for the full implementation of the Project. The country delegations agreed for active participation in the Demonstration and Testing Phase of the Project to be executed during the monsoon season of 2005 (June to September 2005) and recommended the Project for financing and implementation. The recommendations of the meeting are given in the box below:

Conclusion of the High-Level Meeting 17-19 May 2005, Thimpu, Bhutan

Participants of the delegations from Bhutan, Bangladesh, China, India, Nepal and Pakistan,

Recognize the urgent need for improved hydrological and meteorological forecasting to provide timely and accurate flood information for saving lives and livelihoods from water induced disasters in the Hindu Kush-Himalayan Region;

Note the existing bilateral agreements between some of the participating countries and the need to support and build on these agreements within the framework of the project;

Further note the recommendations of the First High Level Consultative Meeting on "Developing a Framework for Flood Forecasting in the Hindu Kush-Himalayan Region," from 15 to 18 May 2001 in Kathmandu, Nepal, endorsing the further planning for regional flood information system and the results of the first meeting of the Consultative Panel for the establishment of an HKH-HYCOS project, from 19 to 21 May 2002 in Kathmandu, Nepal that resulted in the development of a Concept Document for the Establishment of a Flood Information System in the Hindu-Kush Himalayan Region;

Recall the endorsement of the first draft project proposal with recommended amendments by the Second High Level Consultative Meeting on "Establishment of a Regional Flood Information System in the Hindu Kush-Himalayan Region," from 10 to 13 March 2003 in Kathmandu, Nepal, with the recommendation to develop a full project proposal to be endorsed by participating countries in a Secretary-level meeting;

Further recall the recommendations of the "Technical Meeting on Country and Regional Telecommunication Strategies, Data Management and Dissemination of Regional Flood Information" 29 November to 1st December, 2004 in Kathmandu, Nepal, and consequent developments towards the planning and implementation of a demonstration phase of the project.

The delegations from Bhutan, Bangladesh, China, Nepal, and Pakistan therefore conclude that:

The Draft Project Document circulated by ICIMOD in collaboration with WMO in April 2005 which was discussed and revised in the High Level Consultative Meeting held 17 to 19 May 2005, after incorporating the comments and observations of the participants, is recommended for financing and implementation.

The country delegations express their willingness to support the further development of the project, as per the projected and agreed plans in the Project Document with amendments for the full implementation of the project.

The facilitating organizations in the development of this project, namely WMO and ICIMOD, will undertake further adequate activities, including resource mobilization, for the full implementation of the project.

The country delegations agree for active participation in the 'Demonstration and Testing Plan' of the project planned to be held during the monsoon season 2005 (June – October)

After receiving the final Project Document incorporating the comments, it will be submitted for necessary government endorsement.

The Indian Delegation attending as observer will place the matter before their government and communicate its views subsequently.

6.7 Demonstration and Testing Phase

The Demonstration and Testing phase was carried out from June to September 2005. On 10 June 2005 as planned, near real-time data sharing on the Project website (www.southasianfloods.org) started. ICIMOD, in consultation with WMO and the USGS developed a web interfaced Flood Information System (FIS). Feedback and suggestions from partners and users of the information on the FIS were used to continually upgrade the FIS to make it more user-friendly. Five countries; Bangladesh, Bhutan, China, Nepal and Pakistan participated in the Demonstration and Testing Phase. India participated as an observer.

The major objective of the Demonstration and Testing Phase was to test the technical feasibility for the implementation of a Regional Flood Information System.

6.7.1 Planning

The Demonstration Phase was planned for the period June to September 2005. The road map was prepared during the Technical meeting held in November 2004. As a first step, ICIMOD, WMO and the USGS prepared a Test Plan Document and finalized it using the comments and feedback provided by partners. The Test Plan document is an operational manual for the demonstration containing aspects related to the planning, test procedures, roles and responsibilities of participants, network configuration, equipment inventory, focal points and e-mail list.

ICIMOD upgraded its own facilities to facilitate the Demonstration and Testing Phase. ICIMOD prepared the infrastructure for the reception, storage and processing of the required information by increasing its Internet bandwidth to 224/576 Kbps to facilitate data hosting and transmission for this Project. In addition, it also implemented an file transfer protocol (FTP) server for backup data transmission and also a mailing list for participants to discuss issues and forward concerns.

6.7.2 Test Procedures

Information from the pilot stations were transmitted to the national centre from each country as was practiced. Data was submitted by the countries generally through the Internet. Other methods such as FTP and email were provided for data transmission which some countries opted for. Figure 2 represents the prescribed data flow from the countries.

The Demonstration and Testing Phase showed the feasibility of an operational flood information system using the public Internet and the existing infrastructure in each participating country with a minimum upgrade of equipment for data collection and transmission for the sharing of real time hydrometeorological data.

The details of the Demonstration and Testing Phase are described in a separate report.

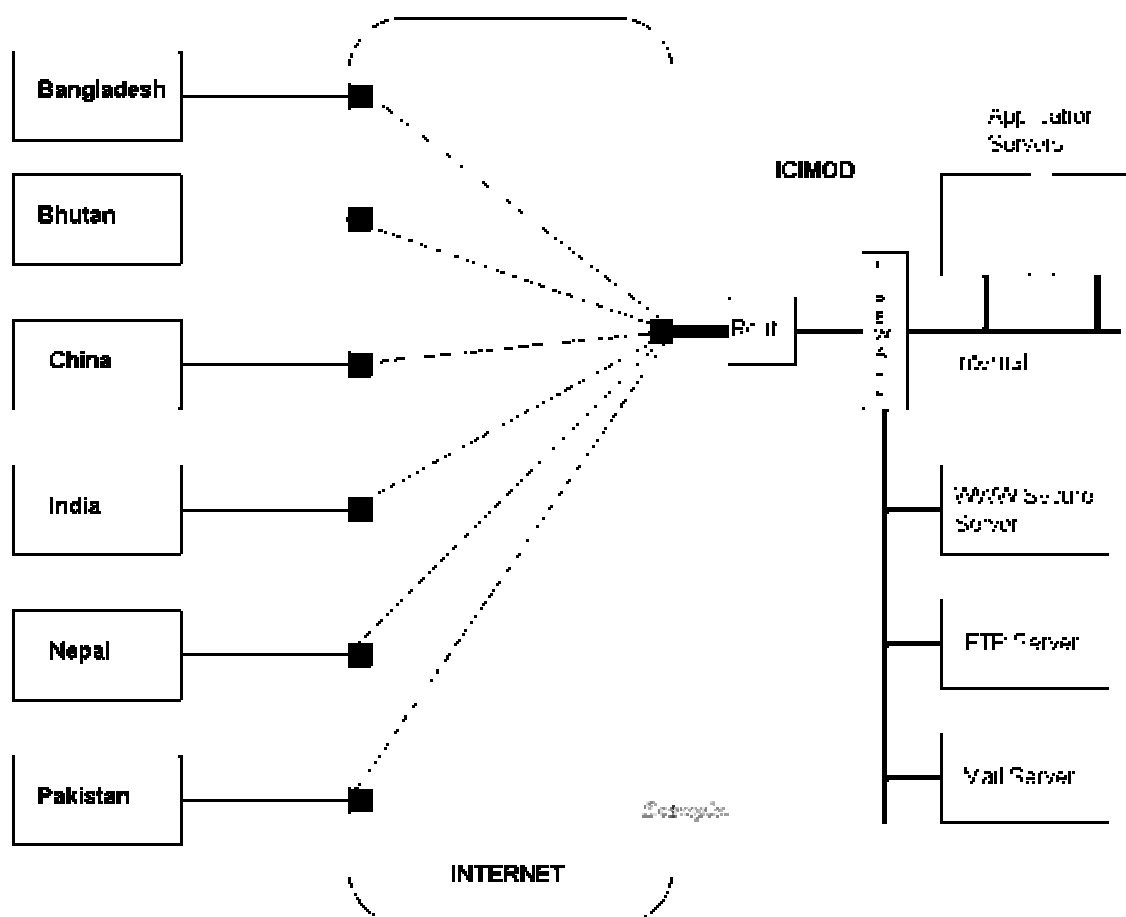


Figure 2: Network Configuration for Sharing Data During Demonstration Phase

6.7 Documents prepared during phase I

As part of the project several documents were prepared. A list of the documents is provided below.

Report of the Consultative Meeting on Developing a Framework for Flood Forecasting in the HKH region, Kathmandu, May 2001

Regional Cooperation in Flood Disaster Mitigation in the HKH, First Meeting of the Consultative Panel, Kathmandu, May 2002

Report of the 2nd High Level Consultative Meeting on Establishment of a regional flood information system, Kathmandu, March 2003

Report of the 2nd High Level Consultative Meeting on Establishment of a regional flood information system, Technical papers presented during the Second High Level Meeting, March 2003

Project document for the implementation of the Phase II of the Project, November 2006
Strategy for the development and use of telecommunication infrastructure in a hydrological information system, October 2004

Telecommunication arrangements for test and demonstration of a regional flood information system (HKH-HYCOS), Test plan document, March 2005

Telemetry and telecommunication for flood forecasting in Nepal, April 2005

National consultation meeting report on the establishment of a regional flood information system in the HKH region, Bangladesh, October 2003

National consultation report on the establishment of a regional flood information system in the HKH region Bhutan, July 2003

National consultation report on the establishment of a regional flood information system in the HKH region China, September 2003

National consultation report on the establishment of a regional flood information system in the HKH region Nepal, March 2004

National consultation report on the establishment of a regional flood information system in the HKH region Pakistan, February 2004

Requirement analysis document, Demonstration and Testing Phase, April 2005

Purchase recommendation report, Demonstration and Testing Phase, April 2005

Report on the Demonstration and testing phase, January 2006

These documents are available at the Water Hazards Environmental Programme (WHEM) of ICIMOD.

VII. The Road Ahead

The road ahead would be the implementation of Phase II “Detailed Planning and Pilot Project Implementation” of the Project. The second phase of the Project directly builds on Phase I to establish a regional flood information system. River level/flow, rainfall and related information will be observed at specific sites and transmitted in near real-time using agreed and reliable means of telecommunication to the National Hydrological and Meteorological Services to be used for flood forecasting and information purposes. The successful implementation of the Phase II Project will lead to the establishment of a fully functional data information dissemination system for floods within selected pilot basins within the GBM and Indus River Basins. As a result of these systems, a considerable extension of the lead-time for flood warning will be achieved in the pilot basins. During the course of the project implementation, information and knowledge dissemination activities will result in improved management and response on community level to mitigate flood disasters. Furthermore, these pilot basin systems will prove that real-time flood information systems can be applicable and institutionalized in the region.

ICMOD is now seeking donor funding for the implementation of Phase II of the Project. The Project Document has been formally submitted to the ADB for their consideration. ADB has expressed interest in the Project. Apart from ADB other possible donors will also be approached for funding to carry the Project forward.